

## **Flammable and Combustible Liquids - §1910.106(a)**

**(18) Combustible liquid** means any liquid having a flashpoint at or above 100°F (37.8°C). Combustible liquids shall be divided into two classes as follows:

(i) *Class II liquids* shall include those with flashpoints at or above 100°F (37.8°C) and below 140°F (60°C), except any mixture having components with flashpoints of 200°F (93.3°C) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.

(ii) *Class III liquids* shall include those with flashpoints at or above 140°F (60°C). Class III liquids are subdivided into two subclasses:

(a) *Class IIIA liquids* shall include those with flashpoints at or above 140°F (60°C) and below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

(b) *Class IIIB liquids* shall include those with flashpoints at or above 200°F (93.3°C). This section does not cover Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

(iii) When a combustible liquid is heated for use to within 300°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

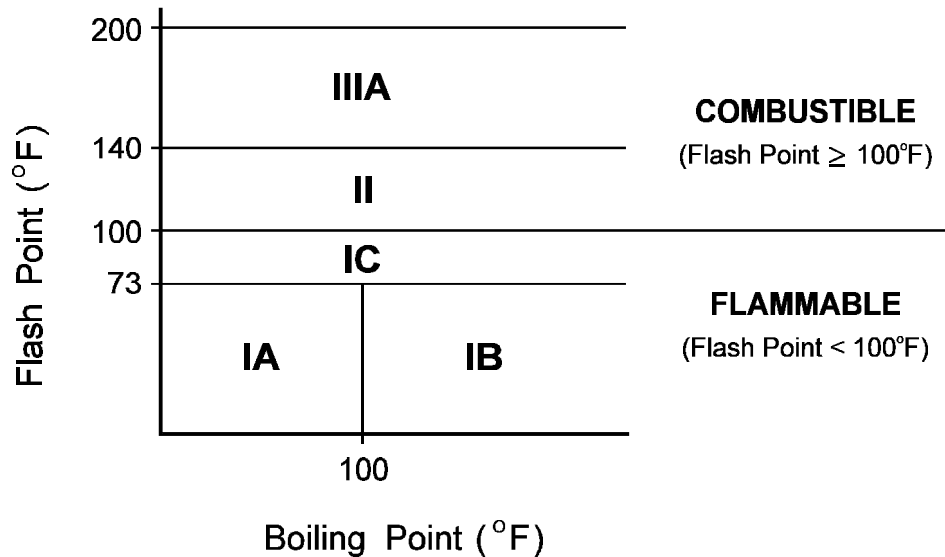
**(19) Flammable liquid** means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

(i) Class IA shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

(ii) Class IB shall include liquids having flashpoints below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

(iii) Class IC shall include liquids having flashpoints at or above 73°F (22.8°C) and below 100°F (37.8°C).

# Classes of Flammable and Combustible Liquids as Defined in 29 CFR 1910.106



**FLASH POINT** -- the lowest temperature at which a flammable liquid will give off enough vapors to form an ignitable mixture with the air above the surface of the liquid or within its container.

**LOWER FLAMMABLE LIMIT** -- the percentage of vapor in the air above which a fire can't occur because there isn't enough fuel: the mixture is said to be too lean.

**UPPER FLAMMABLE LIMIT** -- the percentage of vapor in the air above which there isn't enough air for a fire: the mixture is said to be too rich.

**VAPOR DENSITY** -- the weight of a flammable vapor compared to air. (Air = 1). Vapors with a high density are more dangerous and require better ventilation because they tend to flow along the floor and collect in low spots.

**PEL** -- the Permissible Exposure Limit of the vapor according to OSHA standards, expressed in parts of vapor per million parts of contaminated air. The PEL is listed because many of these substances present inhalation as well as fire hazards.

## Classes of Some Flammable Liquids

### Class IA

| Liquid               |                     | Flash Point (°F) | Boiling Point (°F) | Flammable Limits |      | Vapor Density Air = 1 | PEL (ppm) |
|----------------------|---------------------|------------------|--------------------|------------------|------|-----------------------|-----------|
| Common Name          | Other Names         |                  |                    | LEL              | UEL  |                       |           |
| 1-1 Dichloroethylene | Vinylidene chloride | 0                | 99                 | 7.3              | 10.0 | 3.4                   | -         |
| Ethylamine           |                     | <0               | 63                 | 3.5              | 14.0 | 1.6                   | 10        |
| Ethyl Chloride       | Chloroethane        | -58              | 54                 | 3.8              | 15.4 | 2.2                   | 1000      |
| Ethyl Ether          | Ether               | -49              | 95                 | 1.9              | 36.0 | 2.6                   | 400       |
| Isopentane           |                     | <-60             | 82                 | 1.4              | 7.6  | 2.5                   | -         |
| Isopropyl Chloride   | 2-Chloropropane     | -26              | 97                 | 2.8              | 10.7 | 2.7                   | -         |
| Methyl Formate       |                     | -2               | 90                 | 5.0              | 23.0 | 2.1                   | 100       |
| Pentane              |                     | <-40             | 97                 | 1.5              | 7.8  | 2.5                   | 1000      |
| Propylene Oxide      |                     | -35              | 93                 | 2.8              | 37.0 | 2.0                   | 100       |

## Class IB

| Liquid                |                           | Flash Point (°F) | Boiling Point (°F) | Flammable Limits |      | Vapor Density Air = 1 | PEL (ppm) |
|-----------------------|---------------------------|------------------|--------------------|------------------|------|-----------------------|-----------|
| Common Name           | Other Names               |                  |                    | LEL              | UEL  |                       |           |
| Acetone               |                           | 0                | 134                | 2.6              | 12.8 | 2.0                   | 1000      |
| Benzene               | Benzol                    | 12               | 176                | 1.3              | 7.1  | 2.8                   | 1         |
| Carbon Disulfide      | Carbon bisulfide          | -22              | 115                | 1.3              | 50.0 | 2.6                   | 20        |
| 1,2- Dichloroethylene | Acetylene dichloride      | 43               | 140                | 9.7              | 12.8 | 3.4                   | 200       |
| Ethyl Acetate         |                           | 24               | 171                | 2.2              | 11.0 | 3.0                   | 400       |
| Ethyl Alcohol         | Ethanol,<br>Grain alcohol | 55               | 173                | 3.3              | 19   | 1.6                   | 1000      |
| Ethyl Benzene         |                           | 59               | 277                | 1.0              | 6.7  | 3.7                   | 100       |
| Gasoline              |                           | -45              | 100-399            | 1.4              | 7.6  | 3-4                   | -         |
| Hexane                |                           | -7               | 156                | 1.1              | 7.5  | 3.0                   | 500       |
| Methyl Acetate        |                           | 14               | 135                | 3.1              | 16   | 2.6                   | 200       |
| Methyl Alcohol        | Wood alcohol,<br>Methanol | 52               | 147                | 6.7              | 36   | 1.1                   | 200       |
| Methyl Ethyl Ketone   | MEK, 2-Butanone           | 21               | 176                | 1.8              | 10   | 2.5                   | 200       |
| Methyl Propyl Ketone  | 2-Pentanone               | 45               | 216                | 1.5              | 8.2  | 2.9                   | 200       |
| VM&P Naphtha          | 76° Naphtha               | 20-45            | 212-320            | 0.9              | 6.0  | 4.2                   | -         |
| Octane                |                           | 56               | 257                | 1.0              | 6.5  | 3.9                   | 500       |
| Propyl Acetate        |                           | 58               | 215                | 2.0              | 8.0  | 3.5                   | 200       |
| Isopropyl Acetate     |                           | 40               | 192                | 1.8              | 8.0  | 3.5                   | 250       |
| Isopropyl Alcohol     | IPA, 2-Propanol           | 53               | 180                | 2.0              | 12   | 2.1                   | 400       |
| Toluene               | Toluol                    | 40               | 232                | 1.2              | 7.1  | 3.1                   | 200       |
| Butyl Acetate         |                           | 72               | 260                | 1.7              | 7.6  | 4.0                   | 150       |

## Class IC

| Liquid                 |                                  | Flash Point (°F) | Boiling Point (°F) | Flammable Limits |      | Vapor Density Air = 1 | PEL (ppm) |
|------------------------|----------------------------------|------------------|--------------------|------------------|------|-----------------------|-----------|
| Common Name            | Other Names                      |                  |                    | LEL              | UEL  |                       |           |
| Isoamyl Acetate        | Banana Oil                       | 77               | 288                | 1.0              | 7.5  | 4.5                   | 100       |
| Amyl Alcohol           | Pentanol                         | 91               | 281                | 1.2              | 10   | 3.0                   |           |
| Butyl Alcohol          | Butanol                          | 84               | 243                | 1.4              | 11.2 | 2.6                   | 100       |
| Methyl Isobutyl Ketone | MIBK, Hexone                     | 73               | 246                | 1.4              | 7.5  | 3.5                   | 100       |
| Naphtha (Petroleum)    | Mineral Spirits, Petroleum Ether | 85-110           | 302-399            | 0.8              | 6.0  | 4.2                   | -         |
| Propyl Alcohol         | Propanol                         | 77               | 208                | 2.1              | 13.5 | 2.1                   | 200       |
| Styrene (Monomer)      | Vinyl Benzene                    | 90               | 295                | 1.1              | 6.1  | 3.6                   | 100       |
| Turpentine             |                                  | 95               | 307-347            | 0.8              | -    | -                     | 100       |
| Xylene                 | Xylol                            | 81-115           | 281-291            | 1.1              | 7.0  | 3.7                   | 100       |

## Class II

| Liquid               |   | Flash Point (°F) | Boiling Point (°F) | Flammable Limits |      | Vapor Density Air = 1 | PEL (ppm) |
|----------------------|---|------------------|--------------------|------------------|------|-----------------------|-----------|
| Common Name          | Other Names   |                  |                    | LEL              | UEL  |                       |           |
| Isoamyl Alcohol      |   | 109              | 268                | 1.2              | -    | 3.0                   | 100       |
| Cellosolve Acetate   | 2-Ethoxyethyl acetate                               | 117              | 313                | 1.7              | -    | 4.7                   | 100       |
| Cyclohexanone        |   | 111              | 313                | -                | -    | 3.4                   | 50        |
| Fuel Oil #1 & #2     |   | 100+             | -                  | -                | -    | -                     | -         |
| Fuel Oil #4          |   | 110+             | -                  | -                | -    | -                     | -         |
| Fuel Oil #5          |   | 130+             | -                  | -                | -    | -                     | -         |
| Kerosene             |   | 110-150          | 180-300            | 0.7              | 5.0  | 4.5                   | -         |
| Naphtha (coal tar)   |   | 100-110          | 300-400            | -                | -    | 4.3                   | 100       |
| Naphtha (High Flash) | 100° Naphtha<br>Safety Solvent,<br>Stoddard Solvent | 100-110          | 300-400            | 0.8              | 6.0  | >4.2                  | 500       |
| Methyl Cellosolve    | 2-Methoxyethanol                                    | 115              | 255                | 2.5              | 14.0 | -                     | 25        |

### Class III

| Liquid             |                                       | Flash Point (°F) | Boiling Point (°F) | Flammable Limits |      | Vapor Density Air = 1 | PEL (ppm) |
|--------------------|---------------------------------------|------------------|--------------------|------------------|------|-----------------------|-----------|
| Common Name        | Other Names                           |                  |                    | LEL              | UEL  |                       |           |
| Aniline            |                                       | 158              | 363                | 1.3              | -    | 3.2                   | 5         |
| Butyl Cellosolve   | 2-Butoxyethanol                       | 160              | 340                | 1.1              | 10.6 | 4.1                   | 50        |
| Cellosolve Solvent | 2-Ethoxyethanol<br>Cellosolve Solvent | 202              | 275                | 1.8              | 14.0 | 3.1                   | 200       |
| Cyclohexanol       |                                       | 162              | 322                | -                | -    | 2.5                   | 50        |
| Ethylene Glycol    | Glycol                                | 232              | 387                | 3.2              | -    | -                     | -         |
| Furfural           |                                       | 140              | 324                | 2.1              | 19.3 | 3.3                   | 5         |
| Glycerine          | Glycerol                              | 320              | 554                | -                | -    | 3.2                   | -         |
| Isophorone         |                                       | 184              | 419                | 0.8              | 3.8  | -                     | 25        |
| Nitrobenzene       |                                       | 190              | 412                | -                | -    | 4.3                   | 1         |

### Non-Flammable Liquids\*

| Liquid               |                       | Boiling Point (°F) | PEL (ppm) |
|----------------------|-----------------------|--------------------|-----------|
| Common Name          | Other Names           |                    |           |
| Carbon Tetrachloride |                       | 171                | 10        |
| Chloroform           | Trichloromethane      | 142                | 50        |
| Ethylene Dibromide   | 1,2-Dibromoethane     | 270                | 20        |
| Methyl Chloroform    | 1,1,1-Trichloroethane | 165                | 350       |
| Methylene Chloride   | Dichloromethane       | 104                | 500       |
| Perchloroethylene    | Tetrachloroethylene   | 248                | 100       |
| Trichloroethylene    | TCE, Trichlor         | 190                | 100       |

\* Non-flammable under normal conditions. Unstabilized trichloroethylene can decompose violently in presence of fine aluminum powder.